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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>A61K 35/34, 35/32, 31/715, 38/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/26789</b> <b>(43) International Publication Date:</b> 25 June 1998 (25.06.98)
<b>(21) International Application Number:</b> PCT/US97/23406 <b>(22) International Filing Date:</b> 18 December 1997 (18.12.97)  <b>(30) Priority Data:</b> 08/769,596 18 December 1996 (18.12.96) US  <b>(71) Applicant:</b> CONSOLIDATED CHEMICALS, INC. [US/US]; 3224 South Kingshighway, St. Louis, MO 63139 (US).  <b>(72) Inventors:</b> MURLEY, Jack, C.; 112 Sunnyside Lane, O'Fallon, IL 62269 (US). BRERETON, John, C.; 770 Straub Road, Chesterfield, MO 63017 (US).  <b>(74) Agent:</b> DENK, Paul, M.; Suite 170, 763 South New Ballas Road, St. Louis, MO 63141 (US).		<b>(81) Designated States:</b> AU, BR, CA, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i>
<b>(54) Title:</b> MICROCLYSMIC GEL FOR TREATMENT OF TISSUE TRAUMA AND BURNS  <b>(57) Abstract</b>  A therapeutic wound gel is provided which will enhance healing of the wound and reduce swelling and elasticity of the skin. Humatrix is bacteriostatic protectant with no bacteriocidal activity. The gel consists essentially of by weight percent, about 88-97 % water, about 0.4-0.6 % carbomer, about 1.2-7.8 % propylene glycol, about 0.6-1.3 % glycerin, about 0.5 % DMDM Hydantoin, about 0-.8 % citric acid, about 0.1 % chondroitin sulfate and animal protein, and about 0-.6 % triethanolamine. The gel is formed in three phases which are combined together, the first phase consisting essentially of about 88-99 % of the water of the gel, the carbomer, the propylene glycol and the glycerin; the second phase consisting essentially of the remaining water, the DMDM Hydantoin, and the citric acid if needed; and the third phase consisting essentially of the chodroitin sulfate and animal protein and the triethanolamine, if needed.		

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**MICROCLYSMIC GEL FOR TREATMENT OF  
TISSUE TRAUMA AND BURNS**

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**Background of the Application**

This invention relates to gels used to treat tissues, and in particular to a gel which stimulates wound healing in chronic wound, 1<sup>st</sup> degree, 2<sup>nd</sup> degree, and 3<sup>rd</sup> degree burns.

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Major tissue trauma requires a lengthy time to heal. If the trauma is not properly treated or managed, the wound can suffer from dehydration, hyperthermia and consequent swelling, hyper-contraction, hyper-granulation, and scarring. These are all obstacles to proper healing and significantly affect health care costs.

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**Summary of the Invention**

One object of the present invention is to provide a gel which will enhance the healing of tissue wounds via bio-chemistry..

Another object is to provide such a gel which will provide rapid heat reduction for the wound bed or damaged tissue.

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Another object is to provide such a gel which will reduce hyper-granulation, hyper-contraction, and scarring.

Another object is to provide such a gel which will enhance the extensibility and flexibility of human skin.

- 2 -

These and other objects will become apparent to those skilled in the art in light of the following disclosure and accompanying drawings.

In accordance with the invention, generally stated, a therapeutic wound gel is provided which will enhance healing of the wound and reduce swelling and improve elasticity of the skin. The gel consists essentially of by weight percentage about 88-97% water, about 0.4-0.6% carbomer, about 1.2-7.8% propylene glycol, about 0.6-1.3% glycerin, about 0.5% DMDM Hydantoin, about 0-8% citric acid, about 0.1% chondroitin sulfate and animal protein, and about 0-6% triethanolamine. The gel is formed in three phases which are combined together, the first phase consisting essentially of about 80-99% of the water of the gel, the carbomer, the propylene glycol and the glycerin; the second phase consisting essentially of the remaining water, the DMDM Hydantoin, and the citric acid if needed; and the third phase consisting essentially of the chondroitin sulfate and collagen and the triethanolamine, if needed.

#### Description of the Preferred Embodiment

The gel of the present invention is made of H<sub>2</sub>O, carbomer, propylene glycol, glycerin, DMDM Hydantoin, citric acid, cromoisit CS (a combination of chondroitin sulfate and hydrolyzed animal protein) and triethanolamine. Carbomer is a homopolymer of acrylic acid cross linked with an allyl ether of pentaerythritol or an allyl ether of shrose, available from Goodrich and which forms stable emulsions of oils in water. The propylene glycol is

- 3 -

provided to slow down the transepidermal loss of water, and thus helps to keep the wound moist. The glycerin, when used in low concentrations, as is done herein, acts to attract moisture from the air onto the skin surface. This also aids in keeping the wound moist. DMDM Hydantoin is 1,3-dimethylol  
5 available from Lonza and is provided to long term stability and preservation. Cromoist CS is a combination of chondroitin sulfate and hydrolyzed animal protein, available from Croda. The Cromoist CS is provided to moisturize the wound and to reduce transepidermal water loss at low relative humidities. The action of the Cromoist CS increases the synergism of the  
10 propylene glycol, glycerine and DmDM Hydantoin render the gel bacteriostatic but not bacteriocidal. This product is designed to be used in conjunction with Techni-Care®, Clinical Care®, and Care-Creme®, in the therapeutic treatment and the extensibility and flexibility of the skin. The chondroitin sulfate in the Cromoist CS is a glycosaminoglycan which acts  
15 as a flexible connecting matrix and serves to promote and accelerate regeneration of the tissue by replicating the natural fibro-connective template and stimulating fibroblast activity. That is, it creates a precursor to collagen formation. The addition of the glycosaminglycans thus helps to increase the extensibility and flexibility of the skin while providing pain reduction by  
20 reducing the heat and swelling of the wound.

The gel is produced in a three phase process, the compositions of which are as follows:

<u>Component</u>	<u>Purpose</u>	<u>Amount (gm)</u>
<b>Phase A</b>		
Water	diluent	90.70 $\pm$ 10.0
Carbomer	humectant	0.5 $\pm$ 0.2
Propylene Glycol	humectant	5.0 $\pm$ 4.0
Glycerin	humectant	1.0 $\pm$ 0.5
<b>Phase B</b>		
Water (UV sterilized)	diluent	1.0 $\pm$ 0.5
DMDM Hydantoin		0.5 $\pm$ 0.1
Citric acid	chelating agent	0.70 $\pm$ 0.25
<b>Phase C</b>		
Cromoist (Chondroitin sulfate and animal protein)	glycosaminoglycan	0.10 $\pm$ 0.05
Triethanolamine	pH adjuster	0.50 $\pm$ 0.25

The gel is made as follows. Sterile H<sub>2</sub>O and Carbomer of phase A are initially mixed together under high shear for preferably 1-2 minutes. The propylene glycol and glycerin are added next in order, again under high shear mixing. The components of Phase B are mixed together and then, when completely dissolved, are added to Phase A and mixed therewith to produce an homogenous mixture. The citric acid is added only if necessary to adjust the pH to a pH of between 6.5 and 7.5. The Cromoist CS, of Phase C is then added slowly to the mixture of Phase A and B. When the Cromoist has been added, the triethanolamine is added to adjust the pH of the mixture to a final pH of about 7.0. Mixing is then continued until a clear gel is obtained.

In use, once a wound has been thoroughly cleaned with an antimicrobial cleanser, the gel of the present invention is applied to the wound. The gel is applied in a layer that is 4mm to 6mm thick. The wound is then covered with a non-occlusive dressing. To maintain a moist wound

environment, the gel is reapplied each time the dressing is changed or twice daily.

Application of the gel has been found to reduce the surface temperature of a wound by 12°C to 18° C in approximately three minutes.

- 5 This prompt cooling reduces hyperthermia and associated tissue swelling. The temperature reduction capacity is essential to pain management attributes of this formulation and for its use in 3<sup>rd</sup> degree burns.

- As variations within the scope of the appended claims may be apparent to those skilled in the art, the foregoing description is set forth only  
10 for illustrative purposes and is not meant to be limiting.

## CLAIMS:

1. A therapeutic wound gel comprised essentially of water, carbomer, propylene glycol, glycerin, DMdM Hydantoin, chondroitin sulfate, and animal protein.

2. The therapeutic wound gel of Claim 1 further including citric acid and triethanolamine to adjust pH of the gel to about 7.0.

3. The therapeutic wound gel of Claim 2 wherein the gel consists generally of, by weight percent, about 88-97% water, about 0.4-0.6% carbomer, about 1.2-7.8% propylene glycol, about 0.6-1.3% glycerin, about 0.5% DMDM Hydantoin, about 0-.8% citric acid, about 0.1% chondroitin sulfate and animal protein, and about 0-.6% triethanolamine.

4. The therapeutic wound gel of Claim 3 wherein the citric acid comprises about 0.5-0.95% of the gel and the triethanolamine comprises about 0.3-0.75% of the gel.

5. The therapeutic wound gel of Claim 4 wherein the gel is formed in three phases which are combined together, the first phase consisting essentially of about 80-99% of the water of the gel, the carbomer, the propylene glycol and the glycerin; the second phase consisting essentially of the remaining water, the DMDM Hydantoin, and the citric acid if needed; and the third phase consisting essentially of the chondroitin sulfate and animal protein and the triethanolamine, if needed.

- 7 -

**AMENDED CLAIMS**

[received by the International Bureau on 12 May 1998 (12.05.98);  
new claims 6 and 7 added; remaining claims unchanged (2 pages)]

1. A therapeutic wound gel comprised essentially of water, carbomer, propylene glycol, glycerin, DMdM Hydantoin, chondroitin sulfate, and animal protein.
2. The therapeutic wound gel of Claim 1 further including citric acid and triethanolamine to adjust pH of the gel to about 7.0.
3. The therapeutic wound gel of Claim 2 wherein the gel consists generally of, by weight percent, about 88-97% water, about 0.4-0.6% carbomer, about 1.2-7.8% propylene glycol, about 0.6-1.3% glycerin, about 0.5% DMDM Hydantoin, about 0-.8% citric acid, about 0.1% chondroitin sulfate and animal protein, and about 0-.6% triethanolamine.
4. The therapeutic wound gel of Claim 3 wherein the citric acid comprises about 0.5-0.95% of the gel and the triethanolamine comprises about 0.3-0.75% of the gel.
5. The therapeutic wound gel of Claim 4 wherein the gel is formed in three phases which are combined together, the first phase consisting essentially of about 80-99% of the water of the gel, the carbomer, the propylene glycol and the glycerin; the second phase consisting essentially of the remaining water, the DMDM Hydantoin, and the citric acid if needed; and the third phase consisting essentially of the chondroitin sulfate and animal protein and the triethanolamine, if needed.

6. The therapeutic wound gel of Claim 1 wherein the gel, when applied to a wound in a pharmaceutically effective amount, reduces the surface temperature of the wound by about 12°C-18°C in about three minutes.

7. The therapeutic wound gel of claim 6 wherein the wound gel comprises by weight percent, about 88-97% water, about 0.4-0.6% carbomer, about 1.2-7.8% propylene glycol, about 0.6-1.3% glycerin, about 0.5% DMDM Hydantoin, about 0-0.95% citric acid, about 0.1% chondroitin sulfate and animal protein, and about 0-0.75% triethanolamine.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/23406

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : A61K 35/34, 35/32, 31/715, 38/00

US CL : 424/548, 549; 514/54, 21

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 424/548, 549; 514/54, 21

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, USPATFULL, MEDLINE, HCAPLUS, EMBASE, BIOSIS- CLAIMED INGREDIENTS IN COMPOSITIONS TOGETHER, ESPECIALLY FOR THE TREATMENT OF SKIN DISORDERS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,519,046 A (NODA et al.) 21 May 1996, see entire document.	1-5
Y	US 5,470,911 A (RHEE et al.) 28 November 1995, see entire document.	1-5
Y	Database HCAPLUS on STN, American Chemical Society, FARINA ET AL., "Method for preparing low free formaldehyde methyol-hydantoins and compositions thereof", AN 1994:245102, EP 571903 A1, abstract.	1-5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search

24 FEBRUARY 1998

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